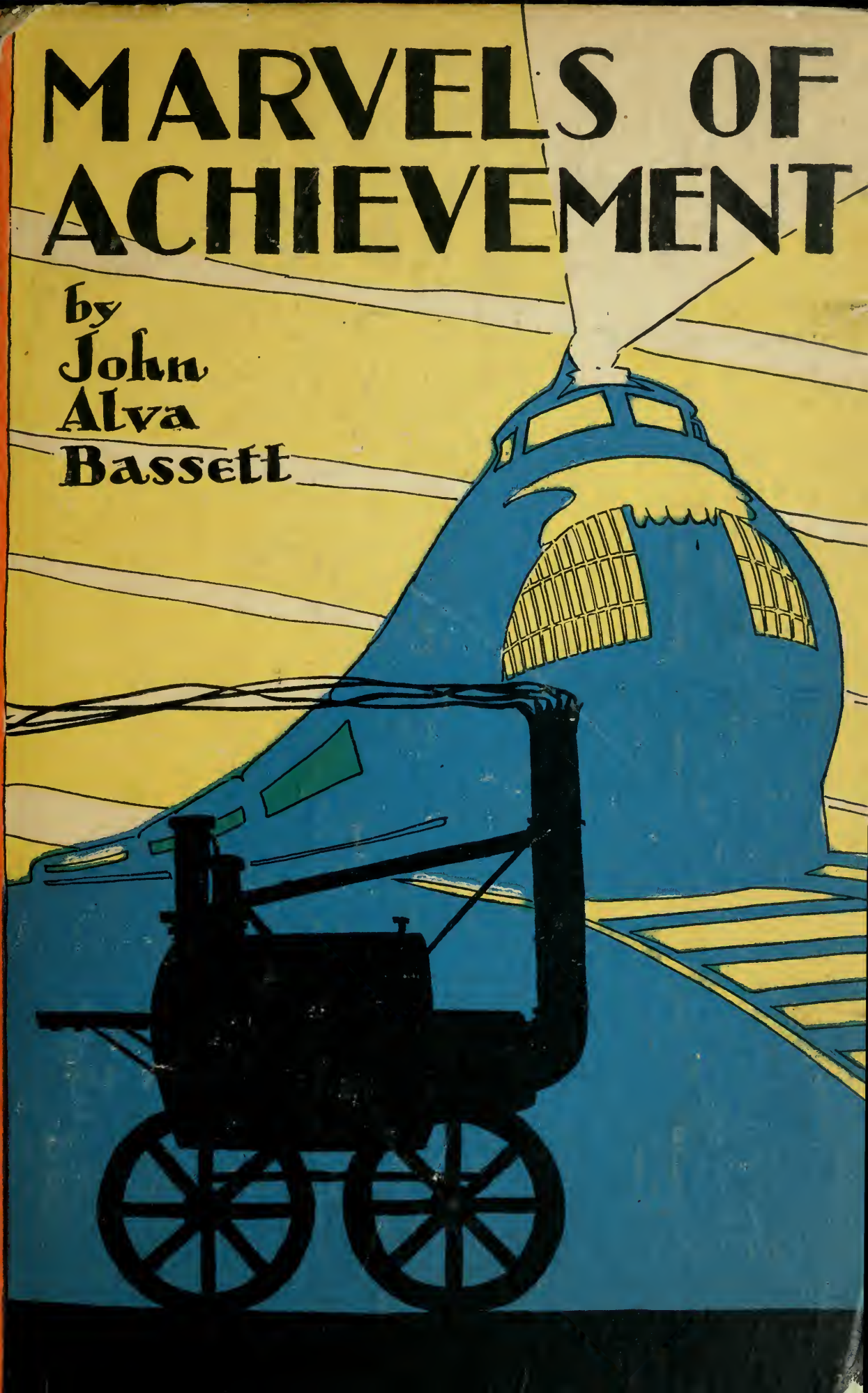
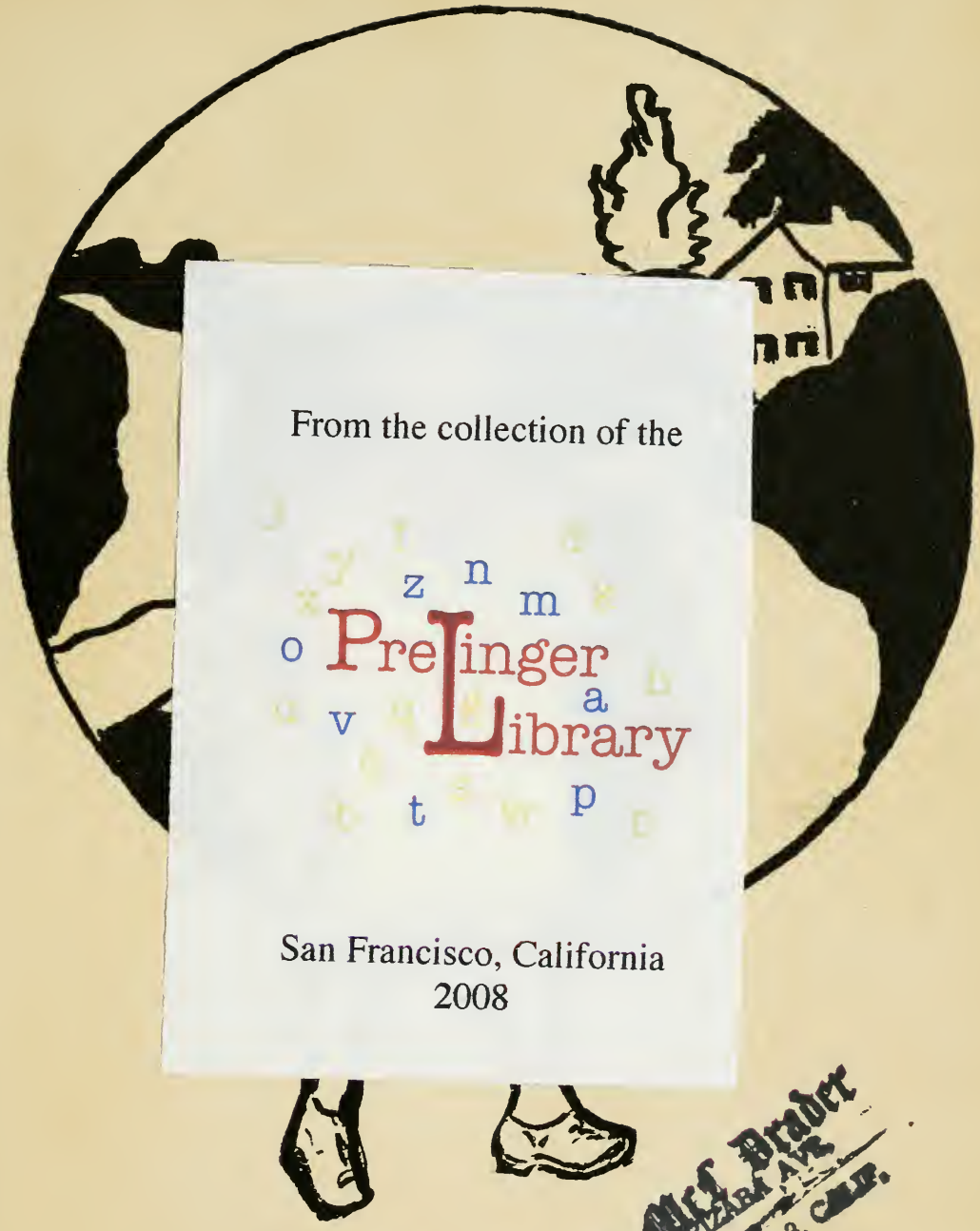
MARVELS OF ACHIEVEMENT

by
John
Alva
Bassett





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Marvels of Achievement

234 ORIZABA AVE.
LONG BEACH 3, CALIF.

Marvels of Achievement

BY

JOHN ALVA BASSETT

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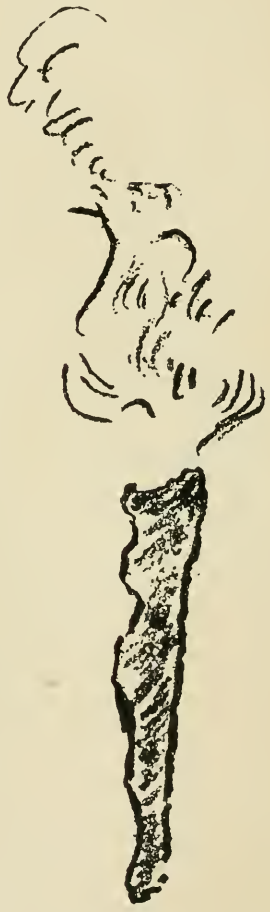
The Marvel of

MAN'S FIRST STRUGGLE FOR EXISTENCE



THE FIRST LAMP

DID you ever stop to think how fortunate you are to be living in the world today instead of two or three hundred years ago?

You get out of bed on a cold winter morning, and the room is warm and comfortable. You don't have to build a fire—the radiator in your room takes care of that. You need water to wash with or to drink? You just turn on a tap and there it is. The bathroom is dark, and you need light? Just press a button and the room is flooded with light. You go to breakfast that your mother or a maid has prepared so easily by simply turning a handle on the gas stove. You sit down to oranges from the south, and coffee from far away Brazil or the Orient. You want milk? You just go to the front door or the dumbwaiter, and

there it is, along with your favorite morning paper. And you have forks—think of it—forks!

You go to school in a swift warm motor bus or car, over smooth, paved, clean roads. Or maybe you walk to school. But you don't walk in fear. That's the furthest thing from your mind. Maybe you don't think you are lucky to go to school. But if you lived back then you would think it a rare privilege, and wish you could be one of the few lucky ones.

School is over. Maybe you go to a movie and see drawings (like Pop Eye) that move and talk and laugh. Or maybe on the screen you are sailing high in the sky with a pilot in an airplane, looking down on the jungles of Africa or the cities of Europe.

After the movies you come home. Maybe you live on one of the upper floors of a tall apartment house. You don't have to climb countless flights of stairs. A swift elevator whisks you up there in a jiffy. You sit down to dinner, to foods brought from the four corners of the earth, that you didn't have to bring. And don't forget. Again you have forks!

After dinner you go to a box standing in the cor-

THE FIRST BOOK

ner of the warm, light, living room, and turn a dial. Instantly the room is filled with music. Or maybe you hear the president's voice speaking from Washington. Or you hear someone describe a hockey game in Canada, or a football game in California. On the table are books and magazines with wonderful stories for you to read, and beautiful pictures for you to see. When you stop to think of it, you really are pretty lucky. Don't you think so?

When our great-great-great-

the world, he came in as empty handed as any of the animals he found about him. Not only that; he wasn't as strong as they were, and he wasn't as swift as they were. He didn't have fur to cover him and keep him warm, as the animals had. He didn't have strong claws and teeth to fight with, to defend himself with, or to hunt with.

But he did have one thing that they didn't have that was more important than all of these. He had a brain. Not that animals haven't a brain. They have. But they don't think very well, and they can't reason at all. And that very great-Grandfather of ours could think, and did reason.

He very soon saw that if he were to live at all he would have to make up for his lack of strength and speed, and his absence of strong teeth and claws by being smarter than the animals were. He would have to use his brain. And that's just what he did. He very soon discovered that a club added to his strength, that a sharp stone or shell could take the place of teeth or claws, and that the two together would give him a weapon that would make him more than a match for most of the savage animals he found.

So he bound his sharp stone to the end of his club and made the first stone axe. If he couldn't run as fast as the animals, neither could they outspeed the stone that he threw. And just as he had added to his strength by his stone axe, he added to the speed of his arm by the sling shot, and later, much later, the bow and arrow.

He needed clothes? He borrowed the skins from the animals he slew. He needed shelter? He built it, high up in the cliffs where he would be safe from

his prowling enemies. He saw how the "Thunder Bird" striking a dead tree set it ablaze; and soon he too learned the secret of fire and its use.

So this very great-Grandfather of ours lived. He

had food. He had shelter. And he had clothing. But so too did the animals around him. And for centuries he was but little better off than they. All that he had accomplished, all that he had done, was merely to make use of the things that nature had provided;

THE FIRST LESSON IN WEAVING

that were right there at his hand to turn to his use. And it wasn't until he made something the like of which hadn't existed before, that he took the first great step which separated him from the savage beasts.

Of course, in the long journey from that day to this man has accomplished many marvels. Merely to list them all would take a book many times the size of

THE FIRST PLOW

this little one, and to describe them all would take a lifetime.

However, there are ten which, it seems to me, are so outstanding that they can truly be called the ten great marvels of achievement, for each of them marked a turning point in our progress. It is almost safe to say that all the other wonderful things that man accomplished are merely changes and improvements based upon these ten. And it is the purpose of this little book to tell you what they are and how they have made your life what it is today.

THE FIRST BOAT

Many wonderful things aren't mentioned here. For example, man mines metals—but that was more a discovery than an achievement. Man improved ships and wagons, he built roads, discovered new lands in far-off places, found new foods, learned to weave clothing, made new materials, improved homes, built cities and aqueducts; all wonderful things in themselves, to be sure, but all simply improvements of these ten great achievements.

The Marvel of
THE WHEEL

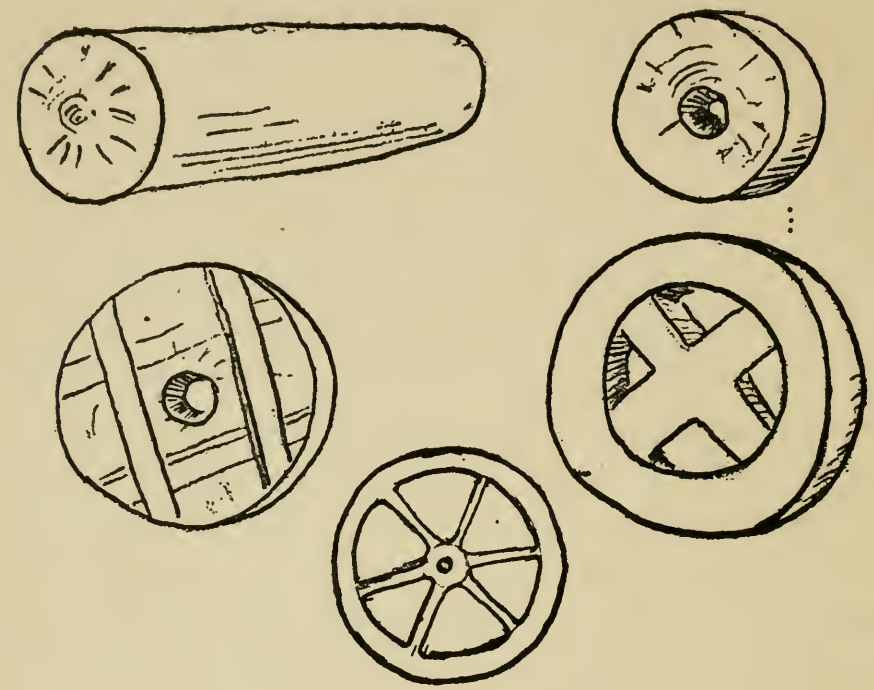
CERTAINLY the first great marvel of achievement was the invention of the wheel. Not only was it of tremendous importance in itself but it also was the first time that this ancient ancestor of ours made something that had never existed before.

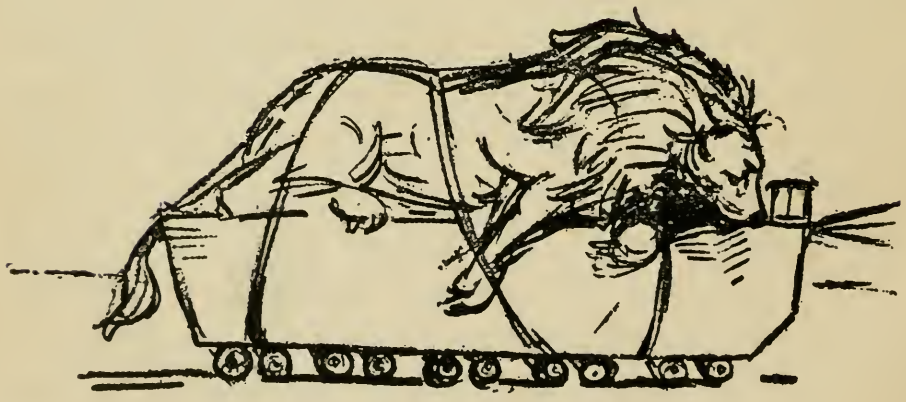
Of course, as in all great discoveries and inventions, no one man is responsible for any of them. For the sake of convenience we tag each great accomplishment with some man's name. For example, if you were asked who was the first man to fly the Atlantic you might answer Lindbergh, of course. And yet, as a matter of fact, instead of being the first he was the 67th. You think perhaps of Edison as the inventor of the electric light, but hundreds of men were working on this marvel at the same time. It was merely that Edison perfected it and made it popular.

Who was the first man to make a wheel? Of course no one knows. How did he come to think of it? Again no one knows, but we can guess.

As you know, when this very great-Grandfather of ours killed an animal he had to drag it wearily up to his cave in order to share it with his family. The same with his firewood and the other things he

needed. No doubt it was hard work and it took him many long, painful hours.





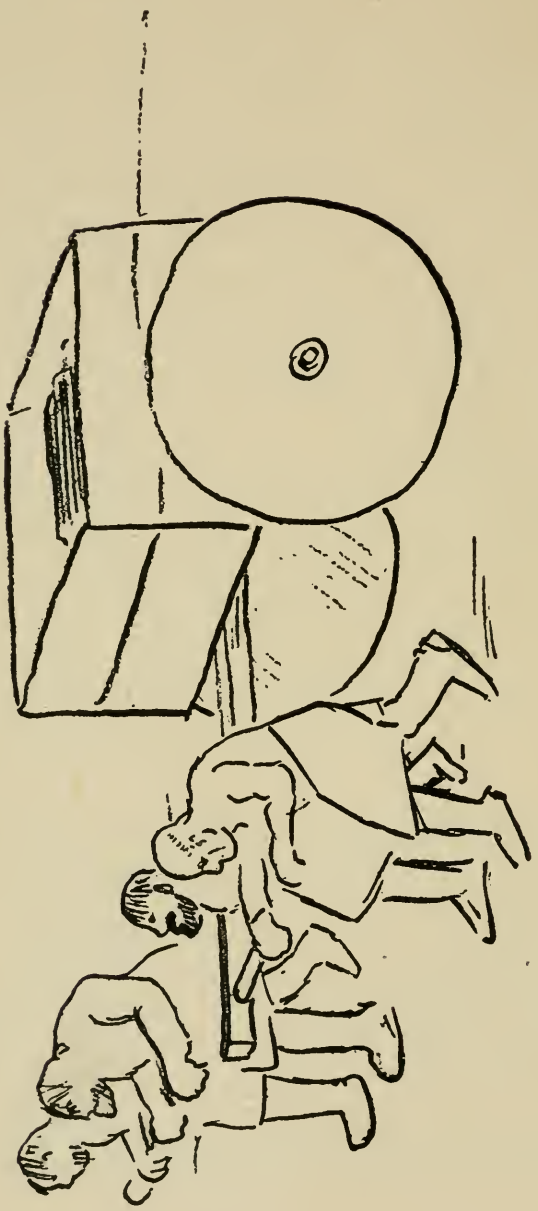
Probably one day when he was resting his load on a fallen log he noticed that the log rolled over and carried the load with it. That must have started him.

Perhaps he used the log as a roller and then, finding the log itself too heavy, cut it into shorter lengths. Then perhaps he learned to put his rough sled on a series of these rollers. However, that was slow work, for he had to collect the rollers and place them on ahead of the sled, and repeat this slow process until he reached his home. So the idea of boring a hole through the center of the logs, joining them with a pole, and attaching them to either side of his sled, must have been the next step. And so he made the first crude wagon.

Of course these first crude carts were probably used merely for hauling, and were drawn by man himself. But the invention of the wheel and the making of wagons must have led to the capture and taming of animals to draw them, and that must have led to the idea of the carts carrying man as well as his goods.

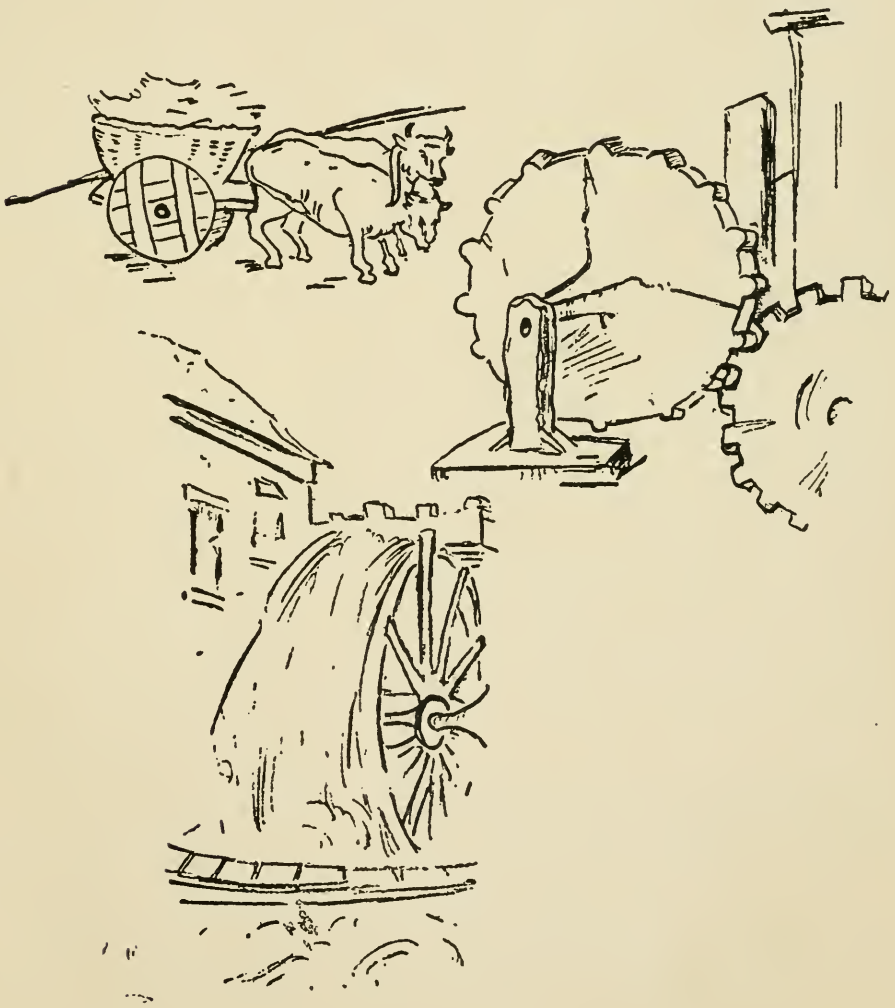
Of course we don't know, for there are no records aside from the old carvings we have discovered. But from them we do know that as long ago as 5,000 years before Christ man had chariots drawn by horses. We do know he used bullocks, oxen, elephants, reindeer and dogs as well as horses. And there is even a report that the Queen of Sheba had a chariot drawn by leopards—but that probably is just a fairy tale.

Another result of the invention of the wheel and the making of carts was that it led man to travel, to see far-off places, and to meet other men and learn



from them. It opened the world of transport and communication. Before this man was limited to rivers down which he floated his raft, and up which he slowly paddled it home. But now there were no limits to where he could go.

Naturally, carts were of no use without roads to use them on. And that led to the building of roads. True, they weren't very good, for even as late as the



reign of Queen Elizabeth stage coaches made only an average of three miles an hour.

However, when you think that without the wheel we would have no carriages, no trains, no automobiles, no airplanes, you will have to agree that the invention of the wheel was one of the great marvels of achievement.

The Marvel of GUNPOWDER

•

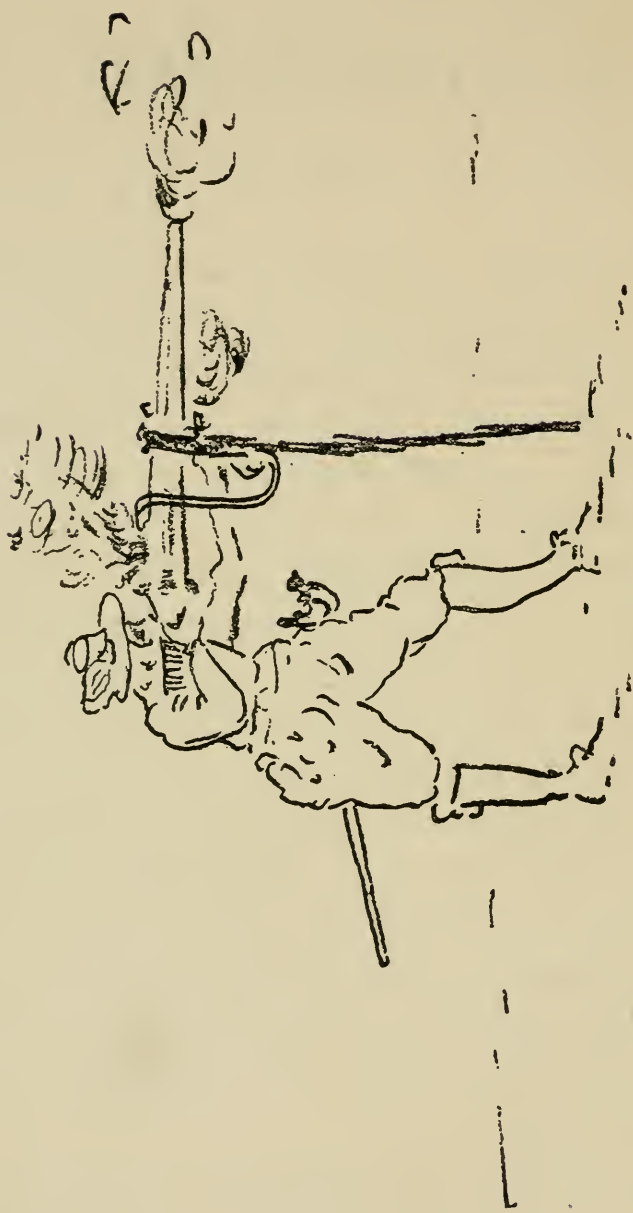
SOMEONE has said that with the invention of the wheel man came of age. He proved to himself that he was better than the beasts of the field. He travelled. He exchanged ideas with other men. He learned to write and to read. He built better homes, learned to weave clothing. He built cities.

But as men banded together in tribes or in nations, some who were stronger became leaders and rulers. As they gained in strength and power they set themselves up as a group, and before long there were two great classes, the nobles and the commoners.

These nobles seized land, and made the common people on the land they seized little better than serfs, or slaves. In battle they were strong, mounted on powerful horses, clad from head to foot in armor. What chance had the ordinary man on foot without armor, with no weapon but his spear, against them? Very little indeed.

But along about the beginning of the fourteenth century the second great marvel was invented. Gunpowder, and its use in cannon and gun.

Who invented gunpowder, and how it was invented are matters of uncertainty. Some say the Chi-

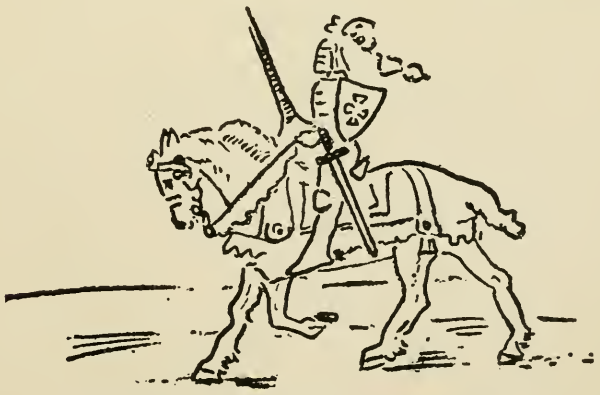


THE FIRST GUN

nese invented it, but nothing definite is known about that. Roger Bacon, a monk, is sometimes called its inventor, for it is true that in 1242 he wrote about it. Others say cannons were first used in the battle of Crecy in 1346. And there is a definite record of its being used in Florence in 1326.

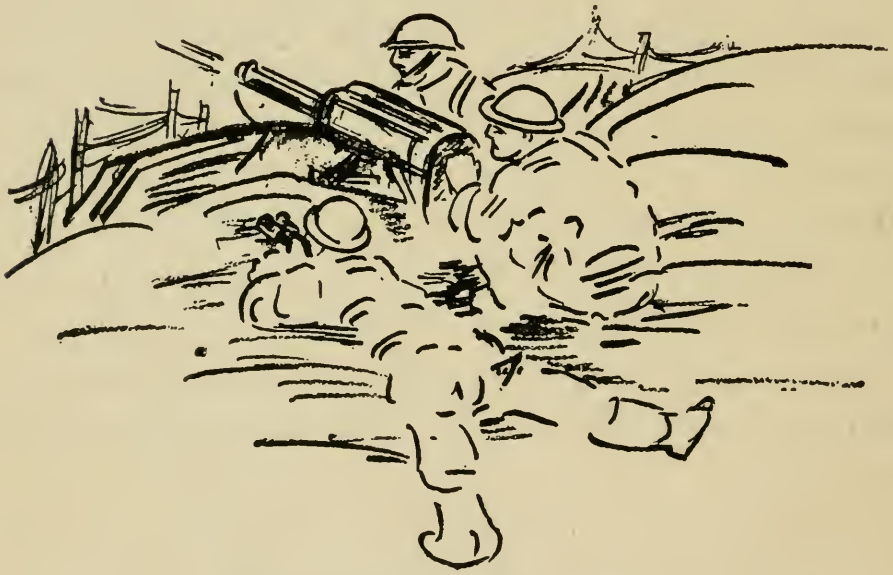
Why do we call the invention of gunpowder one of the great marvels of achievement? Not simply that it revolutionized warfare, but more than that. It made men equal. Just as this very great-Grandfather of ours discovered that the building of his stone axe made him the equal of the stronger and fleeter animals about him, so man discovered that the gun makes all men equal. No longer would the knight mounted on his charger, and clad in shining armor, frighten the common man on foot, clad only in cloth. For the speed of the bullet could penetrate any armor, and outrun any horse.

Of course, it was true then as it is now that there still were men who stood above their fellow men,



THE KNIGHT IN ARMOR

who gained power and riches at the expense of their neighbors. But at least they gained it by the strength and power of their brain. For now finally and for all time, as far as brute strength was concerned, all men were alike.



THE MODERN WARRIORS

The Marvel of
THE PRINTING PRESS

IN A previous chapter I mentioned the fact that man had learned to read and write. That is not strictly true. *Some* men had learned to read and write. Schools were scarce, and only the wealthy attended them. They were located in monasteries, and the monks were the teachers. So few people, in fact, could write that men called scribes earned their living by writing letters and messages for the great mass of those who couldn't write at all.

Such few books as existed were written out by hand, as you write your exercise books, and as each book took months to write you can well imagine how scarce they were. That was why only the wealthy could afford to buy books; and they were kept carefully guarded in private libraries where very few had access to them.

You can imagine the terrible result of this, a complete ignorance of most men on all the subjects in the world. A man who could read and write and own books in those days was because of this much more powerful than his fellow man who couldn't. In fact, this state of affairs was so bad that the average man looked at the few men who could read and write with

superstitious awe, and would usually believe everything that he was told.

Then as now playing cards were extremely popular. These cards were generally painted by hand. Later someone more clever than his fellows made a stencil, and so could paint several packs in the time it had taken to make one card before. Still later, someone had the idea of making a block design of each card. This he did by drawing the design on a block of wood, cutting away that part of the wood not containing the design, coloring the raised portion, and pressing it down upon the card, very much like you make block print Christmas cards today. These blocks were also used for making crude reproductions of paintings of the Saints.

In 1399, in the town of Mainz in Germany, a boy by the name of Johannes Gutenberg was born. When he grew to early manhood he married and set up shop as a lapidary. A lapidary is a man who cuts and polishes jewels and precious stones.

Johannes Gutenberg and his wife were very happy together. His business was good, and he was well liked by all his friends and neighbors.

One day his wife asked him to make a block print of a painting of Saint Christopher that hung on his wall. He protested that this wasn't his business and that he didn't believe he could do it. However, she pleaded so hard that at last he consented. The finished print was so good that she urged him to make

others. This was a simple matter since his block was already cut.

He did as his wife asked, and hanging a copy in his shop, he soon found that he sold more pictures than precious stones. One day he took a copy of his Saint Christopher to a near-by monastery where the good friars admired it so much that they ordered one for themselves.

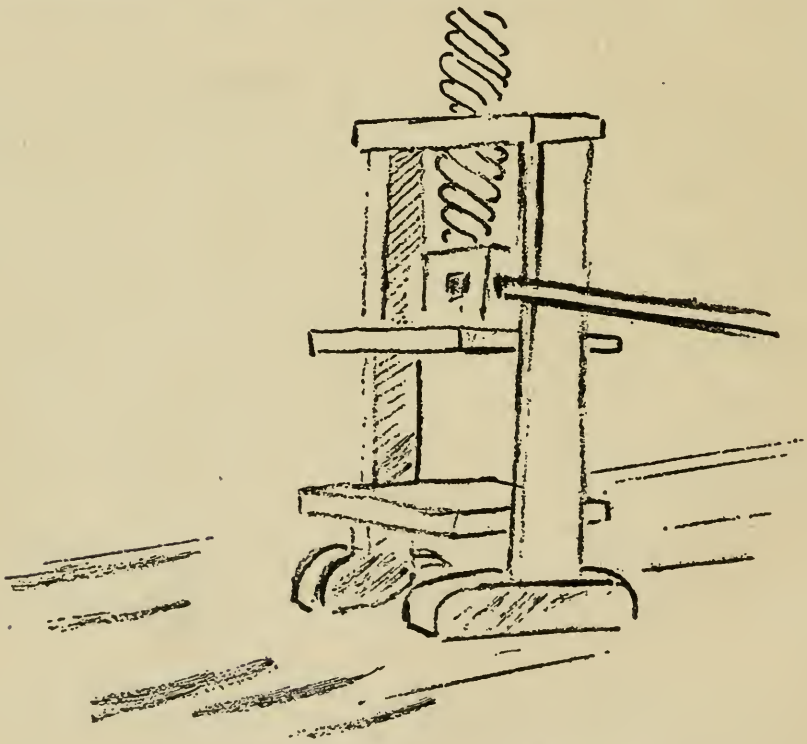
While in the monastery Gutenberg begged permission to see one of the manuscripts that the monks had written; and when they granted this permission he asked to be allowed to make a copy of one of its pages.

Taking it home with him, he worked in secret until he had made a complete block of the page, letters and all. When this was done he pressed the block on a paper and was delighted to see that it was as clear and beautiful as the original. He took it back to the monastery and was complimented on the excellence of his copy. The work was so good that he was readily granted permission to copy other manuscripts. The monks thought, of course, that he was writing them out by hand just as they had done for hundreds of years before. Gutenberg guarded his secret carefully.

One day, while working on a block, it fell from his hand and broke. His wife gave a cry of dismay, but he looked down on the broken pieces, buried in thought.

"Why," he said, "wouldn't it be possible to make smaller blocks of sections of the sheet? I could work more easily and if I spoiled one I wouldn't have to make an entirely new block."

So he began gradually to make smaller and smaller blocks until finally the great idea came to him to make individual blocks of the individual letters. Then, he thought, I can use the same letters over and over again by merely rearranging the letters to suit the word. So he worked for weeks and weeks, cutting his individual letters.



THE FIRST PRINTING PRESS

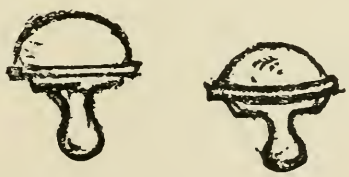
He found some woods too porous, others splintered. Finally he hit upon apple wood as the perfect

material. Now the problem arose of how to bind the letters together to make a word. First he did this with silk thread, but the words spread and blotted, and he spoiled so many sheets that it was scarcely worth the time and effort he spent. Besides, pressing the blocks by hand he often got the words out of line. Some were too dark, others too light. Frequently one block would blot and spoil the whole page.

So he said, "This will never do. I have got to discover some way to bind all the words together and print the whole page at once."

So he went to his friend who made wine presses, and not telling him his purpose, got him to make a press very like the presses they used for making wine.

Then building a frame the size of his page, he arranged his letters very much as today we put together a jigsaw puzzle. Now by means of the press he was able to get the same pressure all the time.



BUFFERS FOR INKING THE TYPE

Gutenberg had a clever apprentice working for him, a lad named Peter Schoeffer. And it was Schoeffer who found the proper metal for the type —a mixture of antimony and lead. Moreover he

made plaster molds for the type, and poured the molten metal into them. When they cooled they had a perfect type—always the same. And what is more—they now had an ample supply.

So Gutenberg decided on a gigantic venture. He would print the entire Bible.

"But what a stupendous undertaking, to print the whole Bible!" exclaimed Schoeffer.

"Yes, a stupendous work," Gutenberg agreed, "and so I want to start on it at once."

With type cast in this new way they printed the first page of their Bible in the spring of 1450. The press worked to perfection, and when they removed the vellum sheet the printed letters were clear, beautifully formed and ranged in perfect lines. So began the printing of what was to become known as the Mazarine Bible. But it was not until five years later, in 1455, that the book was finished.

The Bible was printed, but its cost had been great, and the return from its sale was small. What do you suppose Gutenberg would have said if he could have looked ahead and seen that in 1926 a copy of this book would sell for $305,000?

This early press of Gutenberg printed twenty impressions an hour. Today with our modern multiple presses it is nothing for us to print 7,000,000 sheets an hour.

But Gutenberg pointed the way: and his name will live forever.

The Marvel of

THE STEAMBOAT

●

AFTER those two great achievements, gunpowder and the printing press, the world went on without any very great change for 400 years. True, the things man had already found he improved—better presses, better guns, better ships. He reached out and discovered new lands and new continents. More and more he learned to read. More and more the knowledge and use of the things he had made became universal—were made part of his everyday life. But as far as any marked advance, any new and startling knowledge was concerned, man stood still.

It wasn't until about the start of the nineteenth century that he took his next great step forward; and his accomplishments since that day have outstripped a hundredfold all that had gone before.

The thing that happened then was the discovery of two great new sources of power. Hitherto all power had been supplied by man himself, by the animals he had tamed and put to his use, or by the natural forces of nature—as, for instance, the wind to move his boats and windmills, and the flow of the water to carry his rafts and turn his mills.

But along about 1800 men began to experiment with two new forces, steam and electricity.

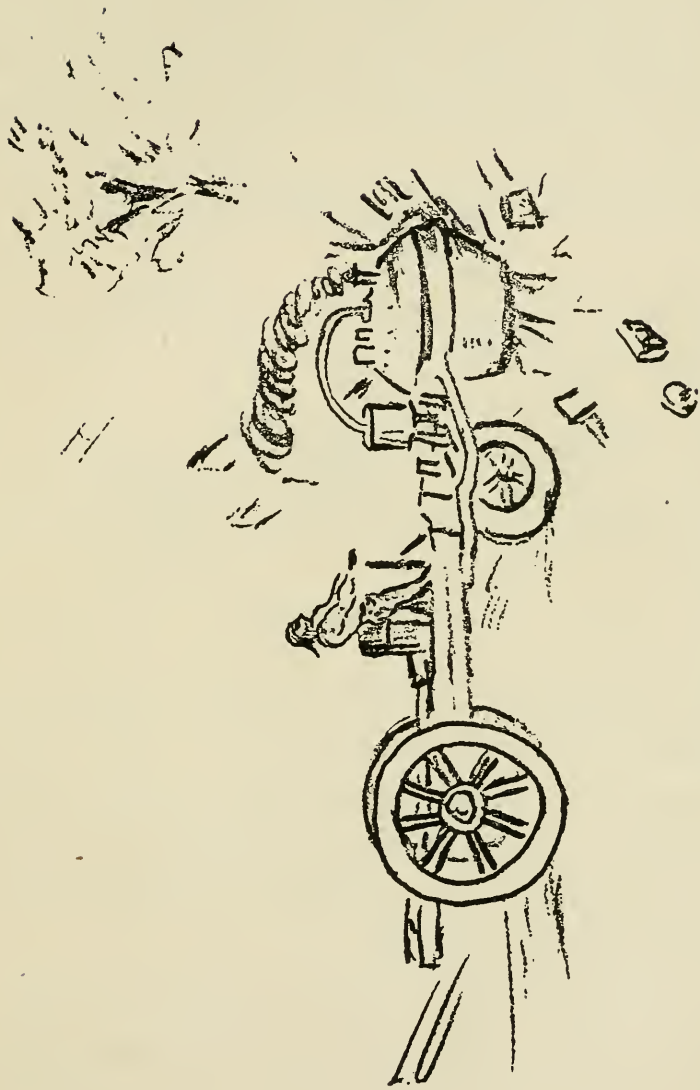
Benjamin Franklin drew down the lightning from the sky. James Watt perfected the first practical engine to run by steam. These two forces opened up an entirely new world of marvels that had been sleeping for all the countless ages before.

The Steamboat

It was no pressing need that drove Johannes Gutenberg to the invention of his printing press. Nor was it necessity that led to Galileo's discovery of the telescope. But it was a very urgent need that led to the building of the steam engine.

England and Scotland found that even with the aid of horses men and women couldn't work the coal mines as they must be worked if their countries were to be kept supplied with coal. The small mines were used up. The larger ones must be deepened, and in that event, it would be too long and difficult a task for men and women to raise the coal in small baskets, or for horses to draw it out. A machine must be made that would do the work more quickly, more easily, and more cheaply. And James Watt made the first practical one shortly before the dawn of the nineteenth century.

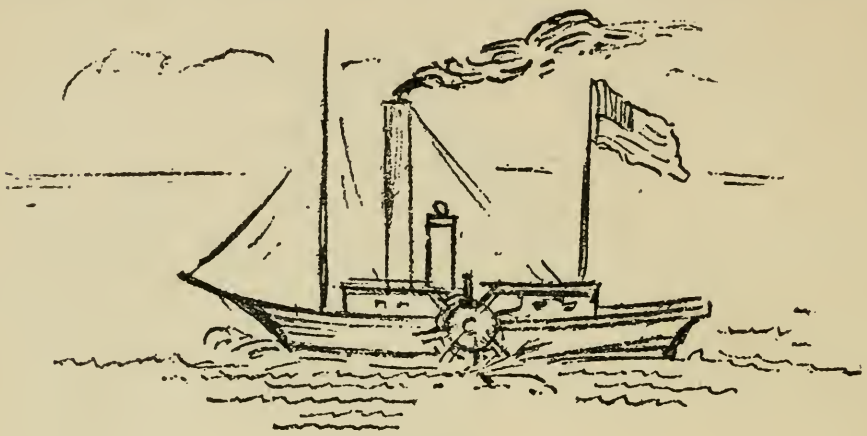
Although the engine of Watt was used to aid in the mining of coal, it wasn't until Robert Fulton



THE FIRST STEAM CARRIAGE

built his steamboat that the steam engine came into its own.

Robert Fulton was a charming and attractive man. He was many-sided—that is, he had many interests, and he could do each of them well. He was a man at home on both sides of the Atlantic at a time when



THE "CLERMONT"

such men were rare. He was a clever artist, and had once taught drawing to Major Andre when the latter was a prisoner of war in the little Pennsylvania town of Lancaster. He had hung out his sign as portrait painter in Philadelphia under the friendly patronage of Benjamin Franklin.

Fulton invented a machine for cutting marble, one for spinning flax, another for twisting rope. He made the first earth-scoop for digging canals. Other men had worked over steamboats, but Fulton reached the goal. He made the steamboat practicable just as Watt had made the steam engine practicable. Above all, he was very fortunate. He found his countrymen

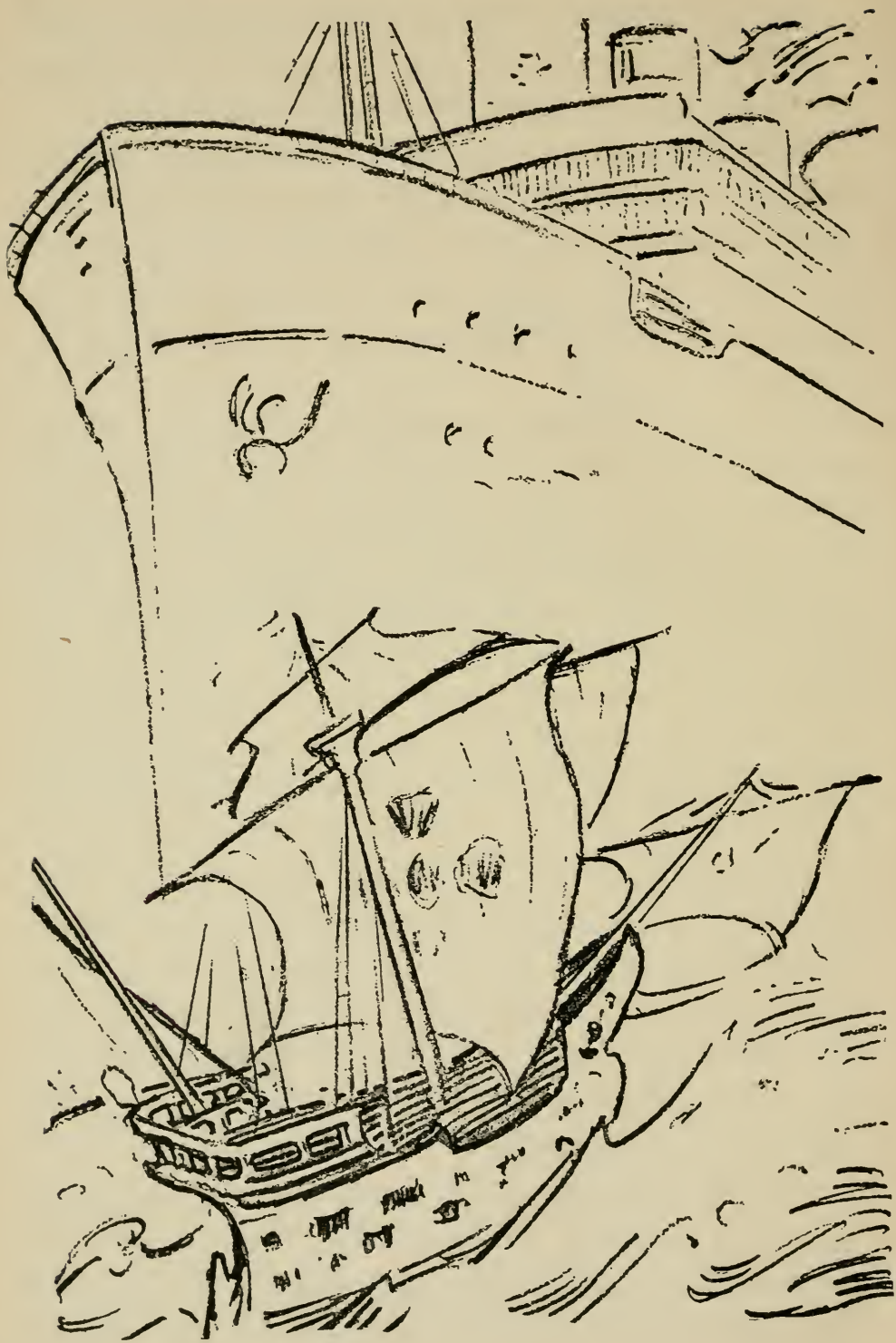
ready to welcome the *Clermont,* something which hadn't been true of other men in England and France who had built similar boats earlier than Fulton.

Some people have called him lucky, have said he was just an amateur who happened to become interested in new methods of navigation. If one grants all this, it is still a fact that it was the *Clermont's* success that opened the waterways of the world to steam.

Fulton had spent a number of years abroad where he was well received. But always he was eager to return to his native land to work on his long cherished plan of building a steamboat. As soon as he reached America in 1806 Fulton started work on his boat. He hired a shipbuilder on the East River in New York City to build the hull. He decided to name the boat the *Clermont* which was the name of Livingstone's country place on the Hudson where Fulton had been a guest.

By August the boat was finished, and was moved by her own engine from the yards to the Jersey shore. On Sunday, August 9th, Fulton made a short trial trip in the *Clermont,* and now he was ready for the test. On August 17th the *Clermont* made her first historic trip up the Hudson. Fulton himself tells about the trip. He wrote:

"The moment arrived in which the word was to be given for the boat to move. My friends were in groups on the deck. There was anxiety mixed with fear among them. They were silent, sad, and weary.



I read in their looks nothing but disaster and almost wished I had never started. The signal was given and the boat went a short distance and then stopped still. There were murmurs, whispers and shrugs. I could hear distinctly 'I told you so. It was a foolish scheme. I wish we were well out of it.'

"I told them I knew what was the matter, and if they would be quiet and give me just a half an hour, I would fix everything up. I went below and discovered the trouble. It was a slight fault in the machinery. In a short time it was fixed. The boat was again in motion, and she continued to move on. They were all incredulous. No one seemed willing to trust the evidence of his own eyes."

The *Clermont,* in spite of all prophecies to the contrary, travelled under her own steam from New York to Albany, and that trip was the crowning event in Fulton's career.

As you can see, the *Clermont* was a simple little boat, and you can also see that it moved through the water by means of a paddle wheel. So once again man had put to use that first great discovery that he had learned back in his very early days—the wheel.

Just look at the picture on the opposite page. It shows the flagship of Christopher Columbus' little fleet that sailed for America in 1492. Compare it with one of the modern liners that now cross the ocean. See what man has accomplished in less than 500 years.

The Marvel of

THE STEAM LOCOMOTIVE

●

THE need of finding a new way of working the coal mines of England and of marketing the coal, which had been such an important reason for the steam engine, was a scarcely less important reason for the building of the earliest practical railroad locomotive. The coal had to be hauled from the pit to the shipping place. It was carried in cars that were pushed or pulled over a crude line of wooden or iron rails. But it was evident from the time that James Watt began to build his steam engine to lift the coal from the mine that someone would soon seek to send the cars over the level ground by the same power.

We owe the railroad chiefly to the needs of the North of England and there we find the real birth of the locomotive. And George Stephenson, a young man working at a coal mine near Newcastle, was the first to perfect it. He had to plan and make many of the tools he needed, and to train his men specially for his business. He built his first engine, which he called the Blucher, near the mine. But it wasn't

much of a success. The engine had no springs and its movement was a series of jolts that injured the rails and shook the machinery apart.

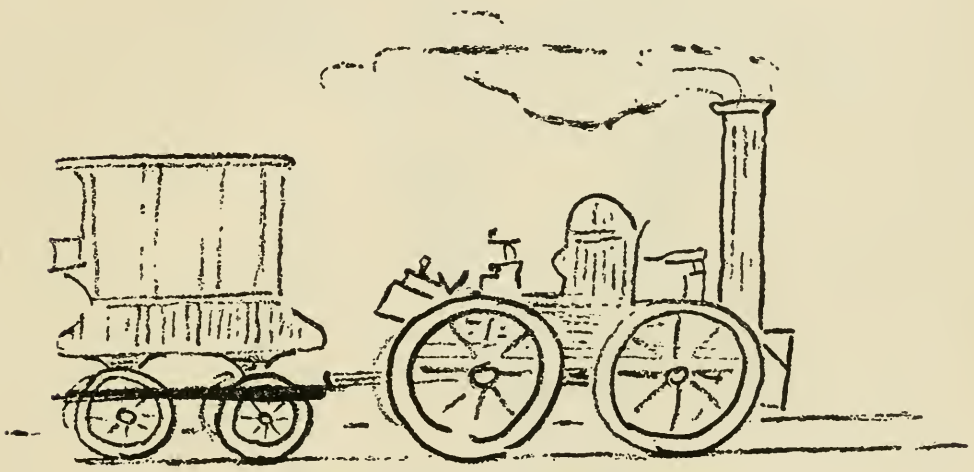
Moreover, the engine moved scarcely faster than a horse's walk, and the expense of running it was little less than the cost of horse power. So Stephenson saw he must in some way increase the power of his engine if he was to gain success.

After months of discouraging work he finally was ready to prove that he had made an engine that was faster and cheaper than horse power. For some time his engine hauled the coal back and forth across the rails near the mine. But news spread slowly in England in those days; and the fact that there was a steam locomotive that was being successfully used attracted very little attention in the rest of the country. It wasn't until Edward Pease planned to build a track long enough to test out the new engine that the world grew to know of the steam locomotive.

In spite of powerful opposition and threats of road trustees and others the line was finally opened for travel on September 27, 1825. A great crowd of people had gathered to see the opening of the first public railway. Everything went well. Stephenson himself drove the engine, and the train consisted of six wagons loaded with coal and flour, a special passenger coach filled with directors and their friends, then twenty-one wagons temporarily fitted with seats for passengers, then six wagons of coal; making

thirty-four carriages in all. An eyewitness described the event thus:

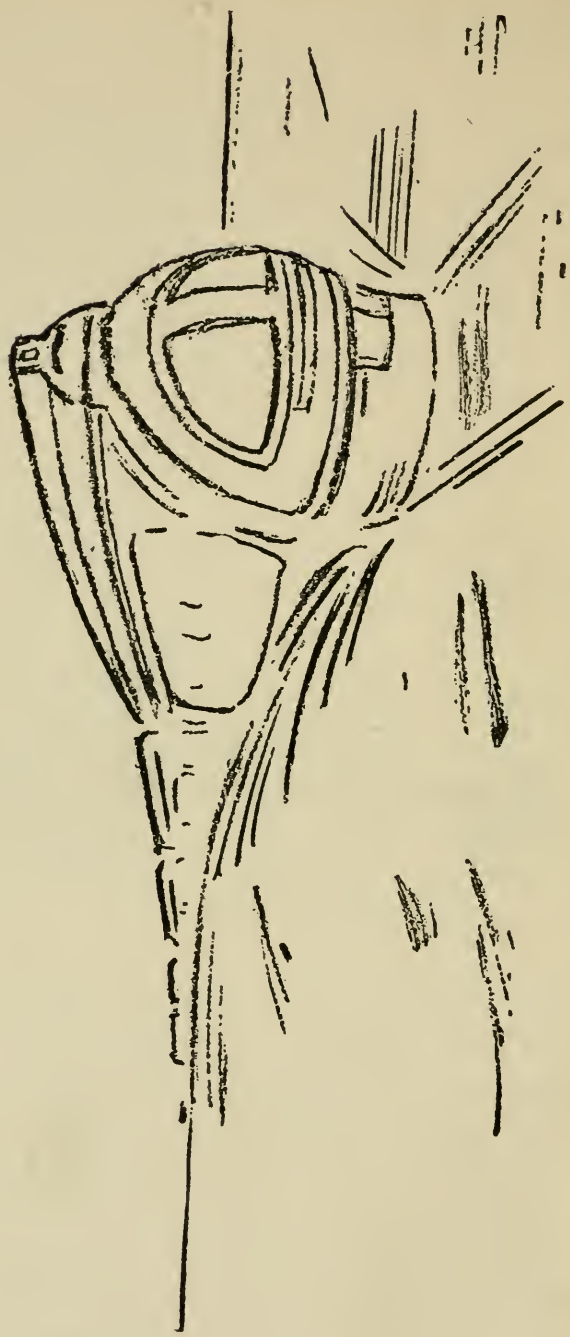
"The signal was given and the engine started off with this immense train of carriages; and so great was the speed that for some short parts of the run it reached the incredible speed of twelve miles an hour! The engine, with its load, reached its destination, a distance of 8¾ miles, in an hour and five minutes."



THE FIRST LOCOMOTIVE

Compare Stephenson's locomotive with the sketch of the Burlington Zephyr, the latest marvel of railway transportation. The Zephyr ran from Omaha to Chicago, 1015 miles, in thirteen hours and five minutes. For nearly 130 miles she ran at an average of 90 miles an hour, and frequently for long stretches at a time, at a top speed of 112 miles an hour.

When we think that our grandfathers crossed the continent to California at the time of the gold rush



in 1849, and that it took them six months or more to reach there; and then think that the Zephyr could cover the same ground in a little over a day and a half, it gives us some idea of what the steam locomotive has added to the world.

234 ORIZABA AVE.
LONG BEACH 3, CALIF.

The Marvel of

MAN'S FIRST CONQUEST OF DISEASE

●

Bacteria—Enemy of Man

MICROBES are the smallest living things in the world. In the space of a dot made by the lead of your pencil there are over a quarter of a million. We cannot see them with the naked eye and we need a microscope to see them at all.

Microscope comes from two Greek words:

"Micro" and "Scope" which mean
"Small" and "Look"

Microbes grow very fast; in fact, one cell, if unchecked, in two days would multiply to 281,000,000,000. This being the case, why don't they overrun the earth? Well, fortunately for the rest of us, most of them are killed off either by heat or by cold or by acid or by other microbes. In fact, sunlight kills most of them instantly.

Many, or most, microbes are useful microbes. For instance, there are microbes which sour milk, and without them we would have no butter or cheese. Others rot plants which enrich our soil, and without

them the earth would be a dry, sandy desert. Some microbes, like those in yeast, help us in making bread.

However, all microbes are not harmless. Many of

MASK WORN TO FRIGHTEN THE EVIL SPIRIT FROM THE SICK

them cause disease. And not until 200 years ago did we imagine such a thing; and it was only about 100 years ago that anyone believed that microbes had anything to do with disease.

The early savages believed that disease was caused by evil spirits or demons. So when anyone was sick they would get together, beat tom-toms, yell, howl, and even beat the patient to make the evil spirits go away. Of course the only result of this was that the sick man died. Oftentimes they would put on hideous masks and dance about the poor patient thinking that this would scare the evil spirit out of him. It didn't scare the evil spirit, but it did scare the poor sick man half to death.

During the middle ages when terrible plagues swept Europe, men believed that the body was made up of equal parts of blood, phlegm, yellow bile and black bile, and that you had to keep them all evenly balanced if you wanted to stay healthy. So most often when a person was sick he would be bled because the doctors of that day thought his sickness was probably due to the fact that he had too much blood.

They had many other silly notions about disease; so it was no wonder that any serious sickness generally meant death. They didn't know that dirt and crowding in dark, filthy hovels overrun with rats spread disease. They didn't know, for instance, that the Black Plague, which every few years swept Europe, and caused the death of thousands, was due entirely to rats.

About the middle of the last century a great Frenchman by the name of Louis Pasteur declared that disease was caused by germs. He meant that harmful microbes—or "bacteria," as he called them

—were growing in the blood and gradually choking the patient to death. As had been true with other great inventors and discoverers, people scoffed, and said he was crazy to say that anything so small that it couldn't even be seen was the cause of death and disease. However, Pasteur proved it, first in the case of a disease that affected sheep, and killed most of them; and later in the case of hydrophobia, which is a disease caused by the bite of a mad dog. Before the time of Pasteur nobody had ever been bitten by a mad dog and lived.

Pasteur's idea for a cure was simply this. He said that if a person could be injected with a small amount of the deadly microbes of hydrophobia, this person's blood could fight it off. Then he would be injected with a stronger dose of his blood, would again fight it off, and this time more easily. Thus by injecting stronger and stronger doses the patient's blood would become strong enough to resist the germs when he was bitten by the mad dog. This is the same sort of thing that happens to you when you begin a new exercise. At first you can only do it for a little while, then every day that you practice you become stronger and stronger, as your muscles get used to the new motion.

This cure by injection discovered by Pasteur is what we know as vaccination, and vaccination has been a marvelous weapon in the prevention and cure of various diseases. For example, we know that since vaccination against smallpox, smallpox

has been practically wiped off the face of the earth. When we think that during the time of our own Revolutionary War, over half the inhabitants had had smallpox at one time or another, we can get some idea of what this wonderful discovery of Pasteur's did for the human race.

The Marvel of
THE TELEGRAPH

●

A YEAR after the death of Benjamin Franklin, on April 27, 1791, there was born in Charlestown, Massachusetts, just about a mile from the birthplace of the great American who, with his kite and key, called electricity down from the clouds, another great American. This was Samuel Morse, the inventor who learned to use that mysterious force in flashing with the quickness of thought the messages of people over wires.

Morse was a painter, and not until he was forty years of age did he turn his thoughts and attention to that wonderful achievement that we now take as a matter of course, and which, you know, due to the discovery of wireless, may soon be as extinct as the ox and cart.

It was a chance remark that took place on shipboard one day during his journey back to America from Italy that led Morse to devote the rest of his life to perfecting his invention of the telegraph.

But it was twelve years later, when, discouraged and well nigh destitute (he had only 37 cents in his pocket) Congress appropriated the $3,000 necessary

to build the wires from Washington to Baltimore for the testing of Morse's great invention.

Despairingly Morse had gone to bed, believing he had failed. The next morning a young lady named Ellsworth brought him the good news, "Congress has passed the bill!"

"Well, dear lady," said Morse, "for this good word you shall send the first message."

And so on May 24, 1844, when the line was completed, Miss Ellsworth came forward with her message, "What hath God wrought!"

Not only had Morse shown the world that messages could be sent over wires to distant points instantly, but he opened the eyes of his fellow men to the wonders of electricity.

The Marvel of
THE TELEPHONE

HAND-IN-HAND with the invention of the telegraph, but infinitely more difficult, was the achievement of the telephone.

I wish I had the time to tell you in detail the story of Alexander Graham Bell and the steps he took in perfecting this seemingly miraculous invention.

He was a teacher of voice culture and corrector of speech defects. It is said he was the first man to teach a deaf mute to talk. He knew all about that wonderful human sound box, the larynx, and he modeled his transmitter on that. But he had to learn as much about the human ear. For one part of the telephone, you know, is a mechanical voice, and the other part is a mechanical ear. Then, of course, he had to know all about electricity, and how to combine these mechanical marvels into a practical instrument. And some thirty years after Morse had perfected the telegraph Bell did the same for the telephone.

We are so accustomed to take these wonderful achievements as a matter of course that it is hard to stop and picture the wires of our country—the very nerves of the nation. These wires go out under rivers, over mountains and deserts, and under the sea. At

the points where wires stop the messages can leap through the air from shore to island shore, or to ships at sea by wireless.

Is there in all the realm of wonderlore a more marvelous story than that of the telephone?

The Marvel of
THE AUTOMOBILE

•

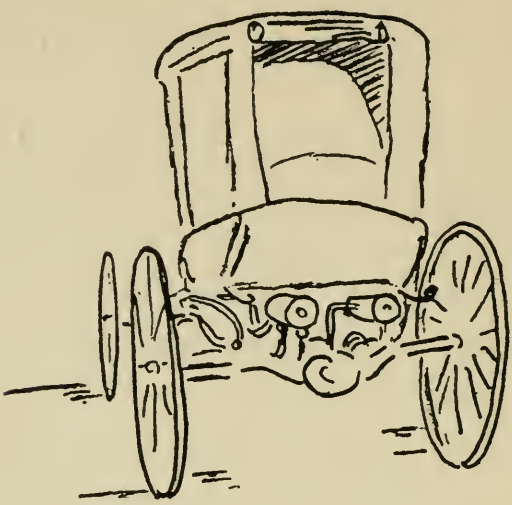
THE invention of the steam engine paved the way for the steam locomotive, and soon trains were speeding to far distant places with a speed hitherto undreamed of. It was only natural that man should resent the fact that this new giant should be confined to the tracks on which it ran.

And so very soon models of the "devil wagon" were laboriously puffing and chugging along the roads and highways. These monsters were things of dread and fear, frightening many people as well as the animals who met them. It is hard for you to imagine what these early cars were like—the terrible banging, clattering noises they made—their terrifying appearance. Furthermore, their speed was about that of a man walking, and laws were passed compelling a guard to walk ahead carrying a red flag as a warning of their approach.

They proved impracticable as well as expensive. The whole trouble with them was that the weight of the engine plus the enormous boiler that carried the water to make the steam made the weight so tremendous that they were of little use.

But along toward the end of the nineteenth cen-

tury a new fuel and a new motor were developed. This motor was called the internal combustion engine, and the fuel was called gasoline, and was taken from ordinary petroleum oil. The result was an engine

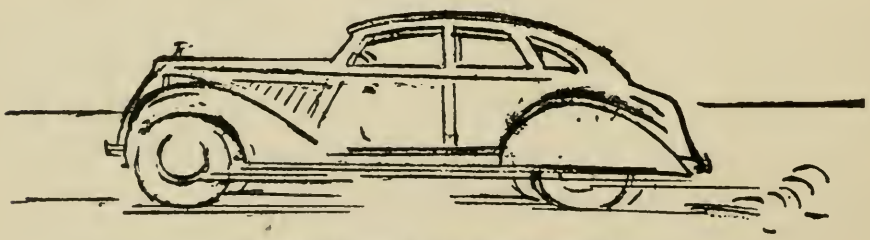


THE "DEVIL WAGON"

that was, at one and the same time, powerful and light.

Immediately the idea of "horseless carriages" was revived.

Although Henry Ford did not make the first automobile, he was the first to make a practical car that was, at the same time, cheap enough for the average



A MODERN AUTOMOBILE

man. And it was Henry Ford more than any other single man who was responsible for the rapid growth and development of the automobile.

It might be interesting to compare the rough drawings of the first automobile made by Duryea with that of a modern streamline, airflow car. It will give you some idea, better than words can tell, of the progress made in automobile mechanics and design in the last thirty or forty years.

The Marvel of
THE AIRPLANE

●

MEN have always wanted to be able to fly. So long as there have been birds to watch, so long have men wondered at the secret of their flying. Early in history men built ships to sail across the sea, but the problem of flying in the air had always baffled them.

The balloon came into being, but the balloon for years was only a toy dependent on the wind, and of the least possible use to men. The thing man had to do was to master the currents of the air, just as the sailing vessel had to overcome the waves and tides of the sea, and the winds of the heavens.

You all know Sir Isaac Newton, and how he discovered the Law of Gravity by being awakened by an apple falling on his head. Well, even so smart a man as he had stated and proved by mathematics that a mechanical flying machine was impossible. The weight of Newton's authority and the weight of figures were such compelling facts that scientists had no mind to doubt it.

Many were injured or killed in these daring experiments, but when has man ever been stopped by the mere threat of danger?

The problem of balancing was still to be solved;

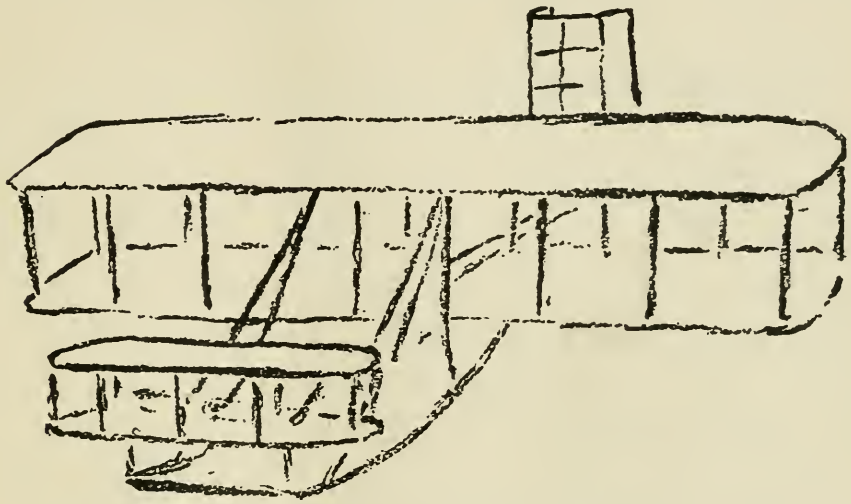
and here Wilbur and Orville Wright came upon the scene. These two brothers started a bicycle shop and bade fair to become ordinary prosperous citizens of Dayton much like their neighbors. They were, however, deeply interested in news from the world of science and invention, and when they read in 1896 of a man who had been killed by falling from his glider, they began to wonder what were the real difficulties that must be overcome in flying.

They built models in their workshop and experimented with them. Then in 1900 Wilbur wrote to his father that he was going on a holiday to a place in North Carolina called Kitty Hawk to try a glider. The Wrights realized that the only problem to be solved was that of balance. Men had made airplanes that would support them in motion, and also engines that were light enough to drive the planes and to carry their own weight and that of the aviator. But when the wind blew, the airplane was as likely as not to capsize.

The air doesn't blow in regular currents. Instead, near the earth it is continually tossing up and down and often whirling about in circles. Previous experimenters had tried to balance by shifting their weight, but this was extremely exhausting and often could not be done in time to meet the changing currents.

The Wrights saw that an easier method of achieving these changes must be found and they worked it out by shifting the rudder and the surfaces of the airship as it met the air currents. They found that two planes

or "double deckers" gave the best results and they used this type because they believed it was the strongest, and could be made more compact; and thus be more easily managed than a single plane or one with many wings.



THE WRIGHTS' FIRST PLANE AT KITTY HAWK

They had success with their glider (or motorless planes) and the next step was to try to find some way by which they could keep the gliding machine continuously in the air. The old method of launching a plane from a hill gave very little chance for a real test. Study taught them that birds are really airplanes, that hawks and gulls stay in the air by balancing on or sliding down rising currents of air. They looked for a place where there would be winds of proper strength to balance their machine for a considerable time as it slid downward, and decided to make their experiments at Kitty Hawk, North Caro-

lina, on the stretch of sand dunes near the Atlantic Ocean.

But in spite of these facts men could see that birds flew although they were often a thousand times heavier than the air they went through, and that sight kept men wondering in spite of all the figures and all the science of the ages.

It was known for centuries that if a kite was held in position by a string reaching to the ground the wind blowing against it would keep it supported in the air. Now if the kite, instead of being stationary in moving air, were to be moved constantly through quiet air it would also stay up. Therefore the motive power must be supplied by the air just as it was in the case of sailing boats. Or it might be supplied by a motor and propellers. But in order to do away with the string which holds the kite in position the airplane, which is only a big kite after all, must have some way of balancing itself so that it will stay in the proper position in the air. So men started to experiment. They built wings that were similar to those of the hawk and the buzzard and other great soaring birds. And in 1891 man began to throw himself from the tops of hills supported by these wings, gliding through the air into the valleys.

In this way he learned new laws of flying, contradicting the theories of many of the scientists, and opening a new world of speculation.

They made new tests and found that a wind of 18 miles an hour would keep their plane and its pilot in

the air. So the next step was to put a gasoline engine on their airplane, and attempt an actual flight.

After many experiments they succeeded, and on December 17, 1903, the first airship made four flights at Kitty Hawk. Its longest flight was 59 seconds, and it flew against a 20 mile wind.

One of the chief reasons for the Wrights' success was that they studied their subject long and faithfully before they tried to fly. They had been in no hurry when they built their first real airship. They made use of all the knowledge they had discovered.

Their first practical test took place over a measured course of five miles from Fort Myers to Alexandria and back, making a total flight of ten miles over trees, railroads, and rough country. Aviators have always claimed that this was a far more difficult course than the crossing of the English Channel, since the great rises and drops of the land made it impossible to maintain a level course.

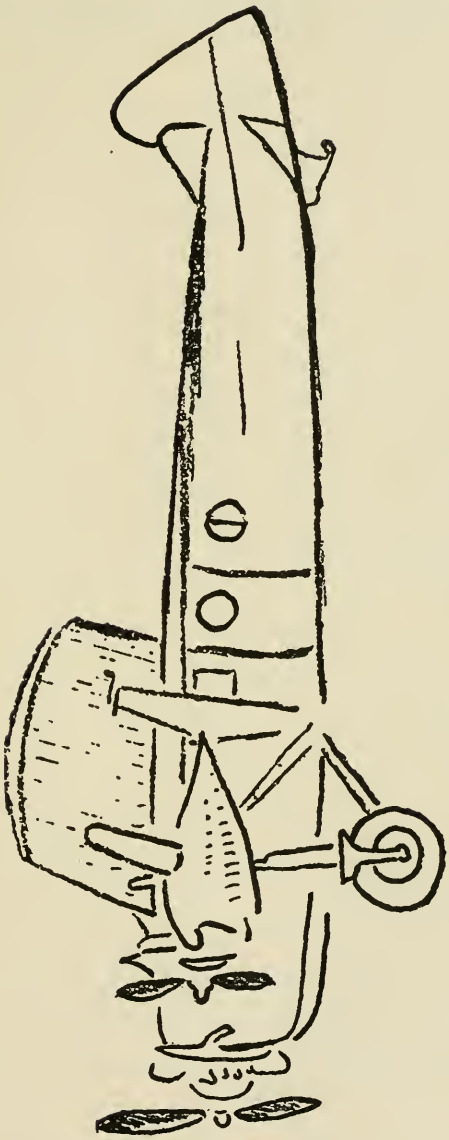
Speed was a very important factor, for the government was to pay the Wrights $25,000 for the airship, and a bonus of 10%, or $2500, for every mile it made above 40. For every mile less the government was to deduct the same percentage. In spite of the fact that the wind conditions were not exactly as Orville Wright wished, he decided to make his flight for speed on that day. He made a good ascension, carrying a young lieutenant with him as passenger. Twice he circled the field in order to get up speed and reach sufficient elevation. Then amid cheers of encourage-

ment from an immense crowd that was watching he turned sharply past the starting tower and flew between the flags that marked the starting line.

On the return the airship met with strong downward currents of air that bore it groundward till it was hidden by the tops of the trees; but Wright managed to send the plane higher and higher, and bring it back over the heads of the crowds at the finish line.

The greatest feat in the history of aviation had been successfully accomplished, and the airship had attained a speed of a little more than 42 miles an hour. The conditions of his contract with the government had been in every respect more than fulfilled.

This was the dramatic start of a new era. Man had conquered the earth. He had conquered the sea. And now at last he was master of the air. Who knows? Perhaps the time is not far distant when rockets with passengers will leave the earth to distant planets, and find new worlds for man to conquer.



MODERN TRI-MOTOR PLANE

Some Modern Marvels of ELECTRICITY

●

The Wireless

GUGLIELMO MARCONI wasn't the first man to experiment with wireless telegraphy, but because of his great share in it, he will be known as its inventor. In 1894 he sent the first electrical message several hundred feet through the air without the aid of a wire; and three years later succeeded in communicating with a ship ten miles at sea.

The first message he sent were the simple letters S O S, and it is fitting now that these three letters should have become the world-wide signal for help from a ship in distress at sea.

But his crowning achievement, and the experiment that focused the eyes of the entire world upon the marvelous possibilities of wireless communication, was the test he successfully carried out of sending his message across the sea from Newfoundland to England.

Just as the telephone followed shortly in the wake of the telegraph, so the wireless telephone followed quickly in the wake of the wireless telegraph; and now sound can travel around the world through the

air as easily and as rapidly as once it did along the telephone wires.

It is this marvelous achievement that enables you to sit in your home, turn the dial of your radio set, and hear the voice of your favorite singer or the music of the world's great orchestras.

Television

After telegraph wires were invented no one would send an urgent message by pony express. And after the Atlantic cable had been laid no one would send an urgent message by boat. What if the telegraph is to go? What if the dots and dashes are to be replaced by a method by which you can send pictures halfway around the world, so that a happening in far-off Japan can be photographed at the time it happens, and printed in your morning paper the day after?

I have just told you that on your radio set you can listen to your favorite singer, and hear your favorite orchestra. In a very short time now you will be able to sit at home on a cold November afternoon, and see the Yale-Harvard football game being played out before your eyes just as though you were sitting in the Bowl watching it. Truly this is an age of marvels that we live in.

The Electric Eye

A comparatively recent invention which has captured the imagination of us all is the development of

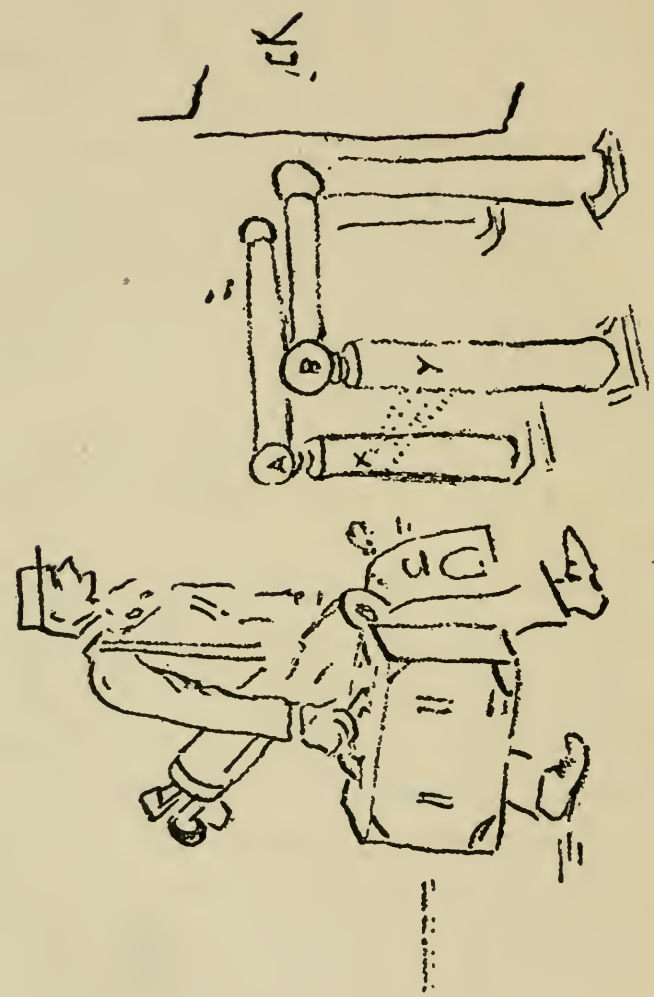
the photo-electric cell which is popularly called the "electric eye."

The first great demonstration of this marvel was at the Century of Progress Exposition in Chicago. The night the exposition opened crowds gathered and stood breathlessly in darkness. At the signal of "Lights On!", the exposition grounds were flooded with brilliant light. Do you know from where the source of power came which lit those lights? From Arcturus, a fixed star, billions of miles distant from the earth. Light from that star, acting on the photo-electric cell, supplied the power that turned the switch lighting the grounds.

The electric eye is hard to explain. Even men of science find it difficult to understand, but we can all marvel at it.

It is really the signal behind the signal. It tells the whistle when to blow, the door when to open. All sorts of things respond as if by magic to its command. It is a doorman, a guard, a watchman, a lighthouse-keeper. In fact, there seems to be no end to its duties.

It counts people and cars. It tells the slightest change in color that cannot be seen by our own eyes. By its aid mailbags are shunted, letters are sorted, and some of the doors in the Pennsylvania Station in New York open as you approach. Thus the electric eye is the doorkeeper. The electric eye set upon the walls of a prison serves warning when anyone crosses the wall, and no prisoner can escape its never-sleeping watchfulness.



THE ELECTRIC EYE

When the porter crosses the beam (X—Y) the door beyond opens as if by magic

The Marvel of

SPEED

IF WE examine all the marvelous achievements that man has accomplished from the earliest days of history down through modern times, we will notice that almost without exception they were concerned with one thing—speed. After all, the wheel enabled our forefathers to travel farther and swifter than they could on foot. It was the speed that gunpowder imparted to the bullet that enabled it to pierce the armor of the medieval knight, and make the common man his equal in strength. It is the speed with which man could transmit thoughts and ideas that gives the printing press the power it has. And the other marvelous inventions—the steamboat, the steam locomotive, the telegraph, the telephone, the automobile, the airplane, and finally the wireless —all resulted in greater and ever greater speed.

In spite of all man had achieved, in 1800 men could move themselves or their goods little faster than they could a thousand years before. It was only by the power of those two twin forces, steam and electricity, that what we might truly call the modern era of speed came into being.

Wise men used to wonder, even as late as 1850,

whether the human frame could stand a speed of 30 miles an hour. And now we are only a bit disturbed at the possible effect on the blood stream of too sharp turns in an airplane going 400 miles an hour.

It took Columbus 70 days to cross the Atlantic. Our big liners today cross it in four. It took our grandfathers months to cross the continent. Today we can do it in a couple of days by train, and in half a day by plane.

We are in sight of a speed of 600 miles an hour by airplane through the stratosphere. That, you know, is just the speed of the sun. Soon we shall beat the sun. Soon perhaps we shall leave London in a fast plane at 8 A.M., and, flying through the stratosphere, reach New York at 8 A.M. the same day. Just a little more speed and we shall soon reach New York "before" we start from London.

Before 1800, if we wished to communicate ideas, or if we wished to signal we could only do so a short distance, for the curvature of the earth stopped us. And the signal fires on the hills had to be relayed. They considered it a great accomplishment in England when they were able to signal from London to Portsmouth, a distance of 70 miles, in eight or nine minutes.

Now, thanks to the wireless and its twin cousin, television, we will soon be able to write a letter in long hand (just as you do in your copy books) and have an exact picture of that letter delivered to a friend in London four or five minutes later. For

wireless travels with the speed of light; and light, as you know, travels 186,000 miles a second.

Now we can pick up a phone and talk to a friend in the middle of the Pacific, to another in Australia, to another in Paris, or to millions of listeners all over the country.

Soon, through television, we will have the news of the world in sight as well as in sound on every apartment or cottage wall.

On the one hand, the airplane, the auto, the train lines take us quickly, invite us to travel and see the world. On the other hand, these wonderful inventions bring the world to us.

Truly we can repeat the first message which Samuel Morse flashed over the telegraph wires nearly a hundred years ago: "What hath God wrought!"

Yes, but also, what hath man wrought!

Some Marvels of

INDIVIDUAL ACHIEVEMENT

THESE wonderful achievements that we have already told you about were of such tremendous importance that they changed the whole history of civilization. But let's look at a few individual achievements of no historical importance perhaps, but yet showing some of the things of which individual man is capable. The men who discovered or invented such marvels as the printing press, the steam engine, and the telescope—will live in history forever. Most of the following are little known, and their fame lived but a brief moment, yet they too have been important if only to show to what limits man can go by his own unaided efforts.

You all know of famous men who have done wonderful things. They were well and strong; or at any rate, had all their faculties. Think how much more wonderful are the exploits of those men who had to overcome such handicaps as blindness, deafness, or some other physical infirmity.

Beethoven, who by many is considered to have written the world's greatest music—great symphonies and operas—was stone deaf. The amazing thing

THE ARMLESS AND SIGHTLESS READER!

is that he used to conduct the scores of his symphonies and operas, taking his cue from the position of the bow and the fingers of his first violinist.

Doesn't this show the power of the mind of man, that brain which we said was the one thing that very great-Grandfather of ours possessed that made him the superior of the savage beasts that were his neighbors?

Of less importance, but perhaps of equal interest, were the feats of some men who had to overcome serious handicaps.

There is a little white haired old man living in Kansas City today. Born in Scotland, he played, studied, and grew to manhood in the manner of most other boys. Years ago he came to America and went out to Colorado, and got a job in a stone quarry.

One day an explosion of dynamite threw him 30 feet into the air. When they picked him up he was without eyes or arms.

What if that had happened to you or to me? We would probably say that we were finished, and quit. But not McPherson. Although he had no arms and no eyes, today he can "read" as well as you or I. How does he do this? With his tongue.

You know the blind have books that they read with their fingers by means of little dots that are raised on the paper. This is called the Braille system. Well, McPherson reads these little dots with the tip of his tongue, and not only that, he turns the pages with it too.

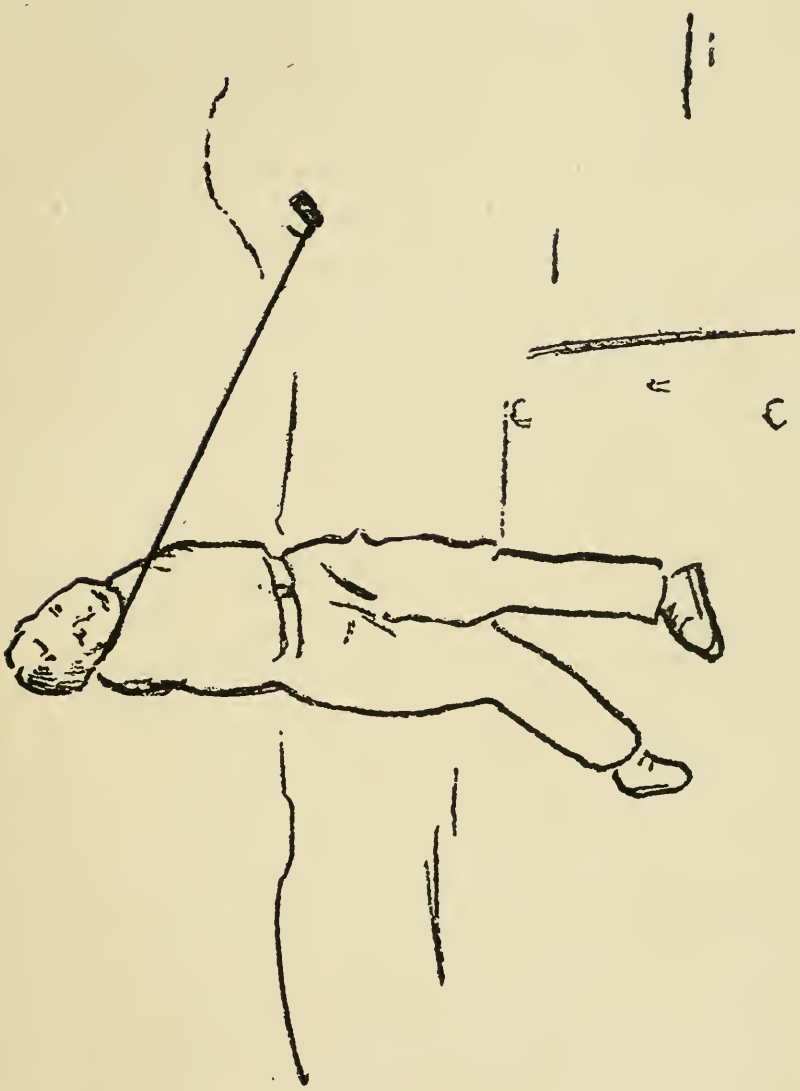
You have all heard about Helen Keller. While she was still a baby she had a serious illness that left her blind, deaf and dumb. Her case seemed hopeless. She had been so young when this terrible illness struck her down that she had learned nothing whatever through her senses, before she lost them.

Her parents were fortunate enough to get for her a teacher and nurse by the name of Mrs. Macy. And through the patience and genius of this wonderful woman, Helen Keller can now read and write and even talk. Perhaps in all the history of the world there is no greater example of the power of an indomitable will. What makes the story even more wonderful is that Helen Keller does all these things better than most people who all their lives have had the advantages she had had to do without.

Would you like to know how this was done? Well, it's a long story. If you are interested, you can find out for yourself. I will just tell you that it was all done through the sense of touch—the only sense Helen Keller had left.

Then take the case of Tom McAuliffe of Buffalo. Tom has no arms, yet he goes out on the golf course and regularly breaks 100. He grips the golf club between his chin and shoulder, and swings it just as you or I do with our two good arms.

Another amazing achievement has always seemed to me that of Francis A. Burdett. Burdett was a jeweller by trade, not a carpenter. He lost his sight after he was fifty years of age. Yet, about thirteen years



THE ARMLESS GOLFER!

later—at the age of 65—when most people are thinking of retiring and living a life of ease, he began to build a house. He did all his figuring mentally, carried the complete plans in his mind, and remembered the progress he was making as he went along.

It took him two and a half years. He was never able to tell exactly where any tool lay, or just what stock he had on hand, or the amount of material he needed. He worked as fearlessly on the roof as he did on the ground. He went over open floor boards, climbed up and down long ladders, put up scaffolds, carried and placed all his own heavy timber, hammered, sawed, nailed so accurately that the average person who looked on thought he could see.

His house is now on public exhibit, a monument to his courage, patience and indomitable will.

You all know about the young Greek boy who ran from Marathon to Athens bringing the news of the Greek victory over the Persians, and whose run is now celebrated every four years at the Olympic Games. The Marathon race, you know, is a trifle over 26 miles, just the distance from Marathon to Athens. Perhaps you don't know that just a day or two before, this same boy had run from Athens to Sparta—a distance of 100 miles—in 48 hours. That was a wonderful achievement without a doubt.

But let's look at a young Norwegian runner by the name of Ernst. Compared to him the young Marathon runner appears to be a turtle.

Ernst ran from Paris to Moscow in two weeks,

AN EARLY GREEK MARATHON RUNNER

swimming a dozen big rivers on the way, yet he averaged 125 miles a day.

He once ran from Constantinople to Calcutta and back, swimming rivers, crossing deserts, enduring dangers and hardships; yet he covered the distance (nearly 6,000 miles) in less than two months for an average of nearly 100 miles a day.

However, not all feats of achievement are marvels of the body. As we have seen, the great things man has accomplished have been done by the brain. A few of these, though of lesser importance, are still a matter for marvel.

I don't know how many of you know how to play chess. If you do play you know what a difficult game it is. If you don't, perhaps you can get some idea when I tell you that the number of possible ways of playing the first four moves on each side in the game of chess is 318,979,564,000.

Now consider the case of Pillsbury, who was the one time American champion. Once Pillsbury played thirty games of chess at the same time against thirty different opponents. And not only that. He played them all blindfolded without seeing a single board or a single piece. And what makes this story still more astonishing is that he won every one of the games.

Then there was the case of John Caspar, a native of Bologna, Italy. In the course of his life he learned to speak 114 languages in addition to 72 dialects. It is said on expert testimony that in at least 54 lan-

guages he was as proficient as an educated native.

It is said that Chinese is the most difficult language in the world to learn, since it has no alphabet, and therefore one must learn the sign for each individual word. Yet in four months Caspar mastered Chinese to perfection. What makes this even more remarkable is that in all his life John Caspar never left his native Italy.

Macaulay, famous English author, wanted to learn Portuguese. He had always promised himself that when he had time he would take up the study of that language. One day he found himself faced with a three months' sea voyage, and thought this would be an excellent opportunity to carry out his long cherished wish.

I suppose if you or I wanted to learn a foreign language, and had three months to do it in, we would get a lot of Portuguese grammars and dictionaries and other books, and study hard. But Macaulay had a different idea. He merely bought a Portuguese Bible and took it along with him on his trip. You see, he knew the English Bible word for word, from cover to cover, by heart. So all he had to do was see the way they said the words in Portuguese in order to learn that language.

Of course, the pages of Sports are filled with records of achievements, and most of you boys who read this book probably know as many of them as I do. However, there are two or three unusual feats that you may have missed.

HE STRUCK OUT 68 MEN IN 45 MINUTES

For instance, do you know that Lefty Grove, one of the greatest left-handed pitchers of all time, once struck out 68 men in 45 minutes? In fact, in a game a few years ago he struck out five men with sixteen pitched balls—and not one of them was a foul.

Another interesting feat that at the same time was a miracle of hard luck was the time Soveski, a young pitcher of Stanford University, while pitching against the University of Southern California, pitched a no-hit game—and yet lost it.

Men have done many wonderful and amazing things—feats of strength and agility, tests of endurance and courage—some merely amusing.

Take, for instance, the two railroad workers in Germany who once drank 352 seidels of beer in one day. This is certainly a feat that you or I would not care to duplicate.

And speaking of enormous appetites—there is the story, which they claim to be true, of the Roman glutton, Torquatos, at the court of Emperor Tiberius. They say he could drink three gallons of wine at a single draught without taking a breath. You know the human stomach is supposed to hold two quarts, so how he ever did it, or why he ever did it, is quite beyond me.

And certainly one of the funniest stories of all time is that of Zeoxis, the great painter, who looked at a picture which he had just drawn and found it so amusing that he laughed himself to death. That's one time that the joke was certainly on him.

TORQUATOS DRINKS 3 GALLONS AT ONE DRAUGHT

No book about marvels of achievement would be complete without at least one outstanding achievement not done by man—but by an animal.

Take, for instance, the story of Cher Amie. Cher Amie was only a bird, without great strength or size, without much of a brain, but with a heart as big as its whole little body, and a loyalty that was unfailing.

Cher Amie was a carrier pigeon, one of the carrier pigeons that the armies of both sides in the World War carried with them to take messages back to the home base when they were out of reach of communication. Cher Amie belonged to the celebrated Lost Battalion, that famous American battalion that, having advanced beyond its objective in the fall of 1918, found itself marooned and surrounded in the thick, shell-torn forests of the Argonne. The situation was desperate. By some means word must be gotten to headquarters of its location and its plight. Two volunteers who offered to try to pierce the ring of steel about them were captured.

Cher Amie was their last hope and Cher Amie didn't fail.

Released with a message tied to her wing, she shot up into the air, wheeled two or three times to get the direction, and headed for home. She flew through a barrage of fire, ducking, swooping, zigzagging her course, and she did at last reach her destination.

She landed with the message still safe under her wing—but with one of her legs shot off. But she had come through. And soon aid was dispatched, and the

Lost Battalion was saved—saved by the loyalty and courage of a pigeon.

Cher Amie recovered from her wound and lived to a ripe old age. When she finally died she was stuffed and preserved, and is now one of the precious relics of the American army.

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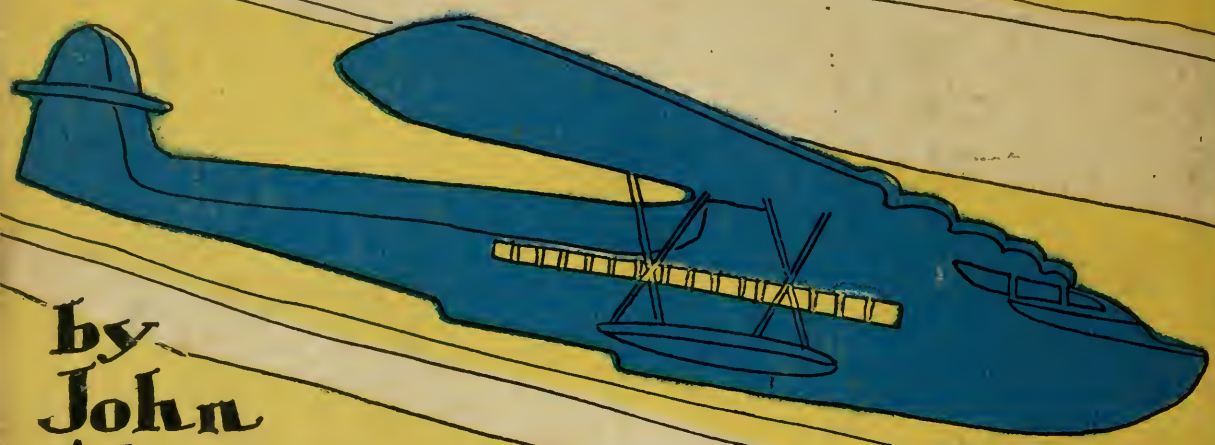
MARVELS OF ACHIEVEMENT



by John Alva Bassett